Secesh River Summer Chinook Salmon Population
Population Viability Assessment

The Secesh chinook population (Figure 1) is part of the Snake River Spring/Summer Chinook ESU which has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde / Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run chinook. The Secesh River population is a summer run and is one of four extant populations in the South Fork Salmon MPG.

The ICTRT classified the Secesh River population as an "intermediate" population (Table 1) based on historical habitat potential (ICTRT 2005). A chinook population classified as intermediate has a mean minimum abundance threshold criteria of 750 naturally produced spawners with a sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

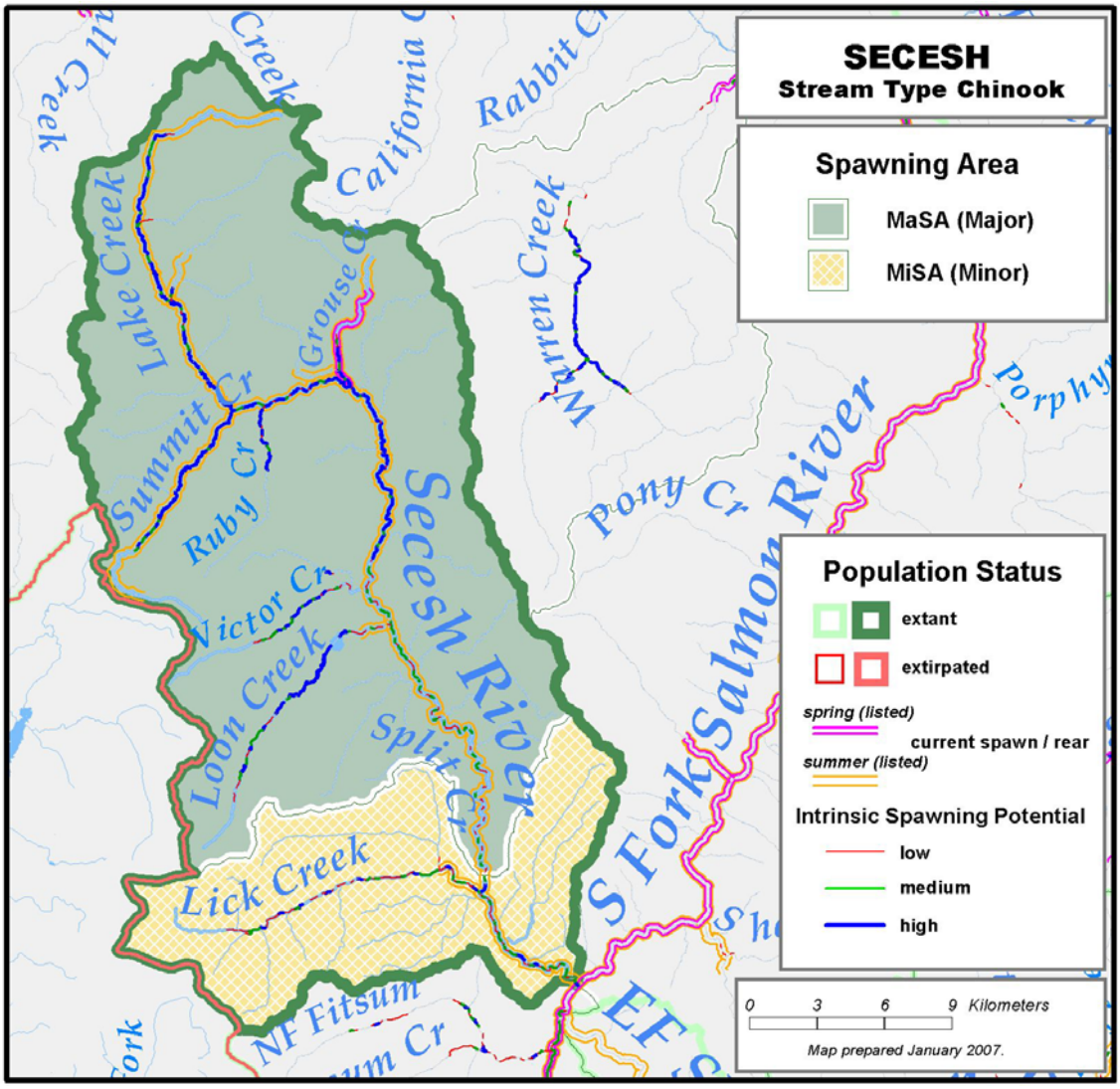

Figure 1. Secesh River chinook major and minor spawning areas.

Table 1. Secesh River chinook basin statistics

Drainage Area (km2)	642
Stream lengths km* (total)	514
Stream lengths km* (below natural barriers)	422
Branched stream area weighted by intrinsic potential (km2)	0.336
Branched stream area km2 (weighted and temp. limited)	0.336
Total stream area weighted by intrinsic potential (km2)	0.458
Total stream area weighted by intrinsic potential (km2) temp limited	0.458
Size / Complexity category	Intermediate / "A" (simple linear)
Number of MaSAs	1
Number of MiSAs	1

*All stream segments greater than or equal to 3.8m bankfull width were included
**Temperature limited areas were assessed by subtracting area where the mean weekly modeled water temperature was greater than 22^{o}C.

Current Abundance and Productivity

Current (1957 to 2003) natural abundance (number of adult spawning in natural production areas) has ranged from 71 (1975 and 1995) to 1,178 in 1960 (Figure 2). Abundance estimates are based on expanded redd counts. Annual abundance estimates for the Secesh River were based o expanded redd counts. IDFG has consistently surveyed two sets of index reaches within the Secesh River drainage for spring and summer chinook spawning (IDFG # WS 16,17 - Secesh mainstem and associated small tributaries and # WS 18,19 the Lake Creek tributary). The length of each index reach surveyed varied among years. We expanded each years results to a total estimated number of redds within index areas using the proportion of the reach surveyed for each particular year and summed the annual counts across index areas. The index areas contained virtually all of the historical spawning habitat identified for this population based on the habitat potential analyses We applied the South Fork average fish per redd (2.31) to the sum of the expanded redd counts (South Fork mainstem and Lake Creek) to generate estimated spawners.

Recent year natural spawners include returns originating from naturally spawning parents, and some hatchery-origin fish were observed on the spawning grounds in recent years. Spawners originating from naturally spawning parents have comprised an average of 99% since 1953, while the most recent 10-year average is 96% (Table 2).

Abundance in recent years has been variable, the most recent 10-year geomean number of natural-origin spawners was 304 (Table 2). During the period 1979-1998, returns per spawner for chinook in the Secesh River ranged from 0.16 (1990) to 4.50 (1996). The most recent 20 year (1978-1997) SAR adjusted and delimited (at 75% of the size threshold) geometric mean of returns per spawner was 1.04 (Table 2).

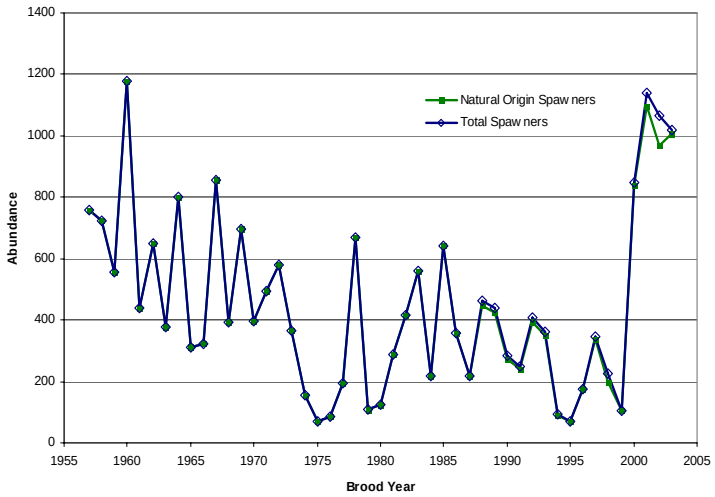

Figure 2. Secesh River abundance trends 1957-2003.

Table 2. Secesh River abundance and productivity measures

10-year geomean natural abundance	304
20-year return/spawner productivity	1.04
20-year return/spawner productivity, SAR adj. and delimited*	1.04
20-year Bev-Holt fit productivity, SAR adjusted	1.37
20-year Lambda productivity estimate	1.07
Average proportion natural origin spawners (recent 10 years)	96%
Reproductive success adj. for hatchery origin spawners	n/a

*Delimited productivity excludes any spawner/return pair where the spawner number exceeds 75% of the size category threshold for this population. This approach attempts to remove density dependence effects that may influence the productivity estimate.

Comparison to the Viability Curve

- Abundance: 10-yr geomean natural origin spawners
- Productivity: 20-yr geomean R/S (adjusted for marine survival and delimited at 563 spawners)
- Curve: Hockey-Stick curve
- Conclusion: The Secesh River population is at **HIGH** risk based on current abundance and productivity. The point estimate resides below the 25% risk curve (Figure 3).

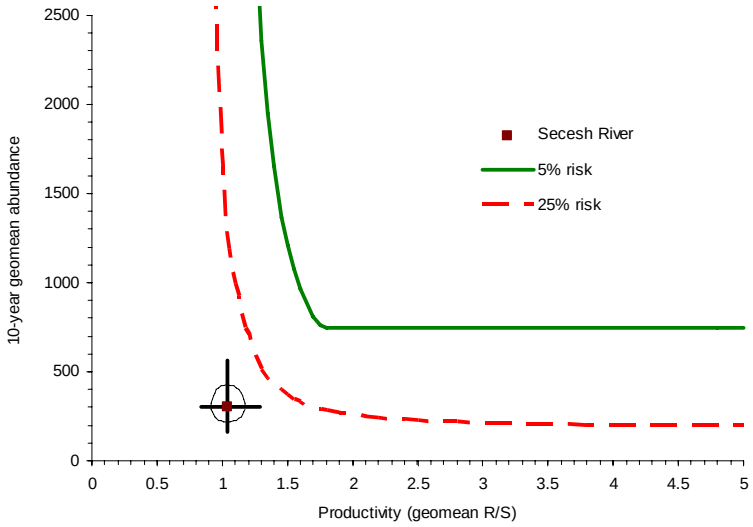

Figure 3. Secesh River Summer Chinook abundance and productivity metrics against a Hockey-Stick viability curve. Dataset adjusted for marine survival and delimited at the median. Estimate includes a 1 SE ellipse, 1.81 X SE abundance line, and 1.73 X SE productivity line.

Spatial Structure and Diversity

The ICTRT has identified one major spawning area (MaSA) and one minor spawning area (MiSA) within the Secesh River Summer Chinook population. Most spawning occurs in the upper mainstem Secesh River and Lake Creek.

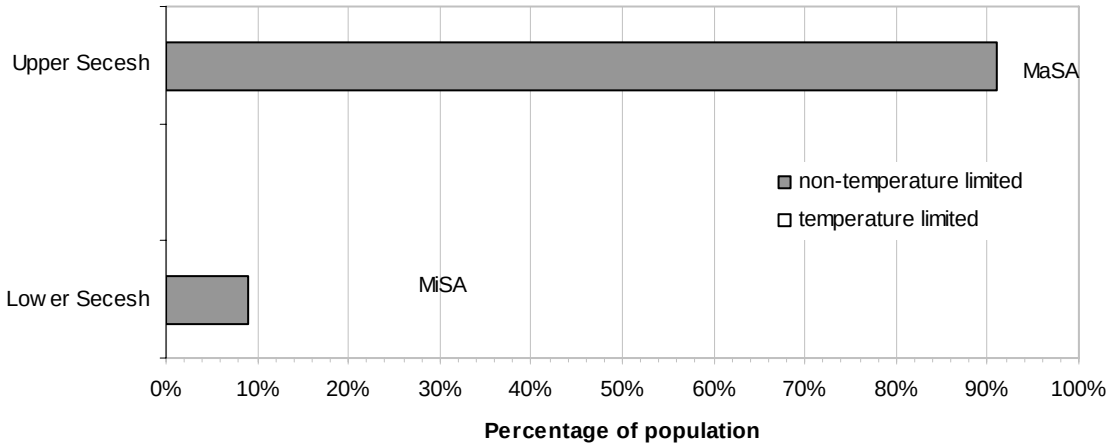

Figure 4. Proportions of major and minor spawning areas that make up the Secesh River population. There are no modeled temperature limitations for the MiSAs and MaSAs in this population.

Factors and Metrics

A.1.a. Number and spatial arrangement of spawning areas.
The Secesh River population of summer Chinook has one MaSA (Upper Secesh) and one MiSA (Lower Secesh). Because there is one MaSA and the weighted area habitat in the MiSA is not greater than 75% the capacity of an MaSA this metric could be rated High risk. However, since the total branched stream area weighted by intrinsic potential is equivalent to 3.4 MaSAs, this metric is rated *Moderate Risk.* The mainstem Secesh River and Lake Creek are considered the principal spawning and rearing habitat for Chinook salmon (USDA Forest Service 2003a). Current core spawning areas are mainstem from Alex Creek to Grouse Creek and Lick Creek from mouth to RM 5 (ICTRT 2003 p. 71).

A.l.b. Spatial extent or range of population.
The IDFG has conducted annual spawner index counts since 1957 on the mainstem Secesh River from Loon Creek upstream to the confluence of Lake and Summit creeks and on Lake Creek from its mouth upstream to Willow Creek. This metric is rated *Low Risk* because current spawning distribution mirrors historical. The MaSA is occupied at both the lower and upper ends. The MiSA is occupied at both the lower and upper ends.

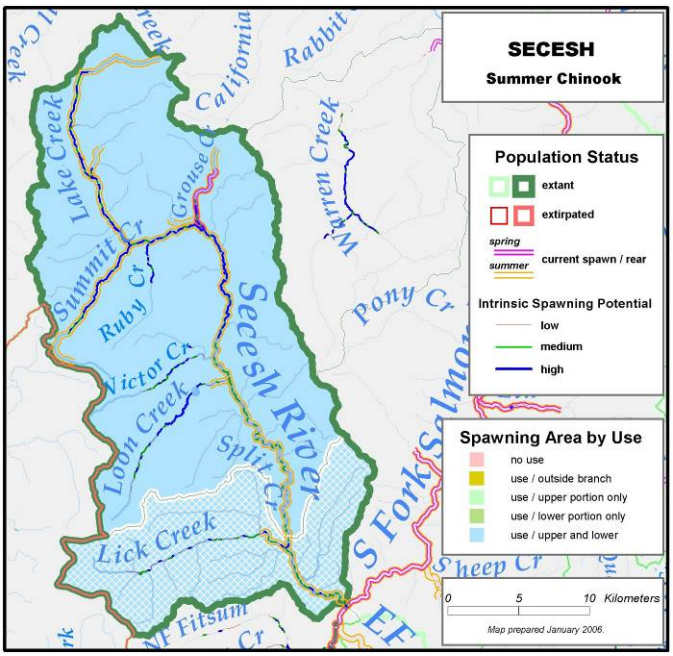

Figure 5. Secesh River summer Chinook salmon distribution.

A.1.c. Increase or decrease in gaps or continuities between spawning areas.
There has been little or no change in gaps when comparing current and historical spawning distribution. The population is rated at *Low* risk because all historical MaSAs are occupied, gap distance and continuity have changed none or little, and there has been no increase in distance between this population and other populations in the MPG or ESU.

B.1.a. Major life history strategies.
There are limited data to allow any comparisons between historic and current life history strategies. The major adult life history strategy is summer run timing. The known major juvenile life history strategy is a spring yearling migrant. No natural or anthropogenic impacts that could have resulted in loss of a life history strategy are known to have occurred. It appears all historic

juvenile and adult life history strategies are present, and the metric is rated *Very Low risk*. There is some evidence that late season spawners also were present in the population (USFS personnel).

B.1.b. Phenotypic variation.
There is no data to indicate that any phenotypic traits have been significantly changed or lost. No alterations of habitat conditions that could have resulted in loss of a phenotypic trait are known to have occurred. No major selective pressures exist which would cause significant changes in or loss of traits. Since there is no direct evidence for loss or substantial change in phenotypic traits; this metric is rated at *Low Risk.*

B.1.c. Genetic variation.
Genetic ratings were based on IC-TRT analysis of allozyme data presented in Waples et al. 1993. In addition, the IC-TRT analyzed WDFW and R. Waples, unpublished allozyme data, and P. Moran, unpublished microsatellite data. There is moderate inter-annual variation among samples. This population clusters with other South Fork Salmon River populations. This metric was rated *Low Risk.*

B.2.a. Spawner composition.
Spawner composition is determined from spawning ground carcass recoveries. Any marked fish that are recovered are examined for the presence of a coded-wire or PIT tag.
(1) *Out-of-ESU strays*. No out-of-ESU strays have been detected spawning in the population and this metric is rated *Very Low* risk.

(2) *Out-of-MPG strays from within the ESU*. No out-of-MPG strays have been detected spawning in the population, and this metric is rated *Very Low* risk.

(3) *Out of population within MPG strays*. Hatchery-origin strays that have been observed in the population in recent years originated from the within-MPG Mainstem South Fork Salmon River population. Proportion of strays observed has been less than 10% per year, and this metric is rated *Low Risk*.

(4) *Within-population hatchery spawners.* There is no within population hatchery program, and this metric is rated *Very Low* risk.

The overall risk rating for metric B.2.a “spawner composition” is *Low Risk* because of the naturally spawning out of population strays.

B.3.a. Distribution of population across habitat types.

The Secesh River population intrinsic potential distribution historically was distributed across two EPA level IV ecoregions, with the Southern Forested Mountains being predominant. The current distribution is nearly identical to the historic intrinsic distribution (Table 3 and Fig. 6). There are no substantial changes in ecoregion occupancy and this metric was rated *Low Risk* for the population.

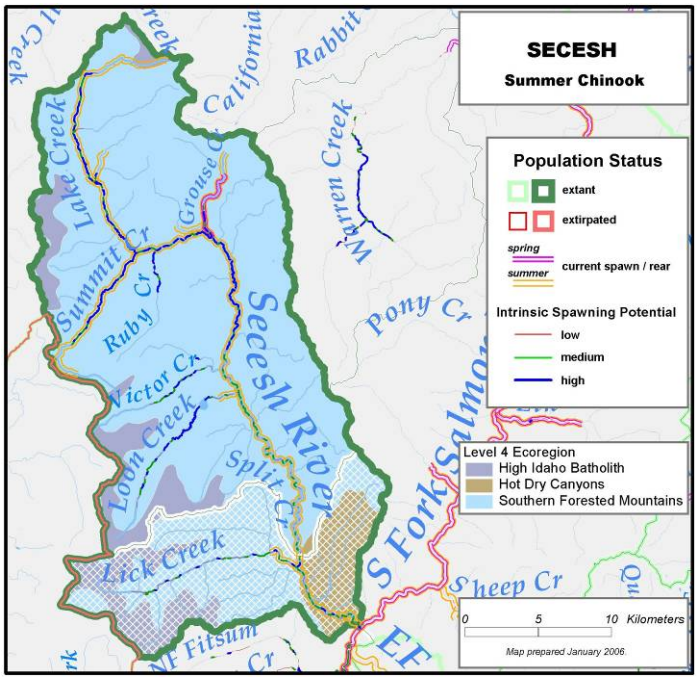

Figure 6. Secesh River chinook population distribution across various ecoregions.

Table 3. Secesh River Spring/Summer Chinook—proportion of spawning areas across various ecoregions.

Ecoregion	% of historical branch spawning area in this ecoregion (non-temperature limited)	% of historical branch spawning area in this ecoregion (temperature limited)	% of currently occupied spawning area in this ecoregion (non-temperature limited)
Hot Dry Canyons	6.1	6.1	11.8
Southern Forested Mountains	93.9	93.9	88.2

B.4.a. Selective change in natural processes or selective impacts.

Hydropower system: The hydrosystem and associated reservoirs impose some selective mortality on smolt outmigrants and adult migrants, the selective mortality is not likely to remove more than 25% of the affected individuals. The likely impacts are rated as *Low Risk* for this action.

Harvest: Recent harvest rates for spring/summer Chinook salmon are generally less than 10% annually. There are no freshwater fisheries directly targeting wild spring/summer Chinook salmon; indirect mortalities are expected to occur in some fisheries selective for hatchery fish. It is not likely that the incidental mortality is selective for a particular group of fish or if it is, it

would not select 25% or more of that particular group, therefore this action was rated as ***Very Low*** risk.

Hatcheries: Although hatchery strays (adult spawners) have been observed in the population since 1988, the proportion of strays has never been estimated as greater than 10%. This selective impact was rated *Low Risk*.

Habitat: Habitat changes resulting from private property development may impose some selective mortality, but the extent is unknown. It is likely that any selective mortality impacts would impact a non-negligible portion of the population. This selective impact was rated *Very Low Risk*.

Spatial Structure and Diversity Summary

Overall spatial structure and diversity has been rated *Low Risk* for the Secesh River population (Table 4). This is the lowest spatial structure/diversity risk level the population could achieve because of the historic (natural) number and spatial arrangement of spawning areas and total amount of intrinsic potential habitat.

Table 4. Spatial structure and diversity scoring table

<table>
<tr><th rowspan="2">Metric</th><th colspan="5">Risk Assessment Scores</th></tr>
<tr><th>Metric</th><th>Factor</th><th>Mechanism</th><th>Goal</th><th>Population</th></tr>
<tr><td>A.1.a</td><td>M (0)</td><td>M (0)</td><td rowspan="3">Low Risk
(Mean=1.33)</td><td rowspan="3">Low Risk</td><td rowspan="15">Low Risk</td></tr>
<tr><td>A.1.b</td><td>L (1)</td><td>L (1)</td></tr>
<tr><td>A.1.c</td><td>L (1)</td><td>L (1)</td></tr>
<tr><td>B.1.a</td><td>VL (2)</td><td>VL (2)</td><td rowspan="3">Low Risk</td><td rowspan="8">Low Risk</td></tr>
<tr><td>B.1.b</td><td>L (1)</td><td>L (1)</td></tr>
<tr><td>B.1.c</td><td>L (1)</td><td>L (1)</td></tr>
<tr><td>B.2.a(1)</td><td>VL (2)</td><td rowspan="4">Low Risk</td><td rowspan="4">Low Risk</td></tr>
<tr><td>B.2.a(2)</td><td>VL (2)</td></tr>
<tr><td>B.2.a(3)</td><td>L (1)</td></tr>
<tr><td>B.2.a(4)</td><td>VL (2)</td></tr>
<tr><td>B.3.a</td><td>L (1)</td><td>L (1)</td><td>Low Risk</td></tr>
<tr><td>B.4.a</td><td>L (1)</td><td>L (1)</td><td>Low Risk</td></tr>
</table>

Overall Viability Rating

The Secesh River spring/summer Chinook salmon population does not currently meet viability criteria because Abundance/Productivity risk is high (Table 5). The 20-year delimited recruit per spawner point estimate is at replacement (1.04). The 10-year geometric mean abundance is 41% of the minimum threshold abundance. Improvement in abundance/productivity status (reduction of risk level) will need to occur before the population can be considered viable. Also, the population currently does not meet the criteria for a "maintained" population, but has the potential to achieve the Highly Viable state because of the current low spatial structure/diversity risk.

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	
	High (>25%)		Secesh River		

Figure 7. Viable Salmonid Population parameter risk ratings for the Secesh Summer Chinook salmon population. This population is not currently meeting viability criteria. *Viability Key: HV – Highly Viable; V – Viable; M – Maintained; Shaded cells-- not meeting viability criteria (darkest cells are at greatest risk)*

Secesh River Summer Chinook – Data Summary

Data type: Redd count expansions
SAR: Averaged Williams/CSS series

Table 5. Secesh River Summer Chinook run data (used for curve fits and R/S analysis). Data used in the productivity calculation (years where the parent escapement was less than 563) are bolded.

Brood Year	Spawners	%Wild	Natural Run	Nat. Rtns	R/S	Rel. SAR	Adj. Rtns	Adj. R/S
1979	**110**	**1**	**110**	**227**	**2.07**	**0.87**	**197**	**1.79**
1980	**126**	**1**	**126**	**361**	**2.86**	**0.58**	**210**	**1.67**
1981	**287**	**1**	**287**	**538**	**1.87**	**0.63**	**338**	**1.18**
1982	**416**	**1**	**416**	**331**	**0.79**	**0.51**	**169**	**0.41**
1983	**561**	**1**	**561**	**442**	**0.79**	**0.58**	**255**	**0.45**
1984	**216**	**1**	**216**	**224**	**1.04**	**1.65**	**371**	**1.72**
1985	642	1	642	402	0.63	1.57	631	0.98
1986	**359**	**1**	**359**	**345**	**0.96**	**1.41**	**488**	**1.36**
1987	**218**	**1**	**218**	**155**	**0.71**	**1.83**	**282**	**1.29**
1988	**463**	**0.96**	**446**	**551**	**1.19**	**0.75**	**412**	**0.89**
1989	**440**	**0.96**	**424**	**221**	**0.50**	**1.79**	**396**	**0.90**
1990	**283**	**0.96**	**273**	**46**	**0.16**	**4.65**	**215**	**0.76**
1991	**249**	**0.96**	**240**	**81**	**0.33**	**3.01**	**245**	**0.98**
1992	**408**	**0.96**	**394**	**236**	**0.58**	**1.65**	**390**	**0.95**
1993	**363**	**0.96**	**350**	**393**	**1.08**	**1.61**	**633**	**1.74**
1994	**93**	**0.96**	**90**	**25**	**0.27**	**1.04**	**26**	**0.28**
1995	**71**	**0.96**	**69**	**125**	**1.76**	**0.60**	**75**	**1.06**
1996	**175**	**1.00**	**175**	**788**	**4.50**	**0.54**	**428**	**2.45**
1997	**346**	**0.97**	**337**	**1364**	**3.94**	**0.30**	**403**	**1.17**
1998	**227**	**0.88**	**200**	**932**	**4.10**	**0.30**	**277**	**1.22**
1999	106	0.97	104					
2000	846	0.99	839					
2001	1140	0.96	1097					
2002	1064	0.91	969					
2003	1021	0.99	1009					

Table 6. Geomean abundance and productivity measures. Abundance and productivity values used in the current status assessment are boxed.

	R/S measures				Lambda measures		Abundance
	Not adjusted		SAR adjusted		Not adjusted		Nat. origin
delimited	median	75% threshold	median	75% threshold	1987-1998	1979-1998	geomean
Point Est.	1.07	1.07	1.16	1.04	1.09	1.07	304
Std. Err.	0.37	0.22	0.19	0.13	0.24	0.14	0.34
count	10	19	10	19	12	20	10

Table 7. Poptools stock-recruitment curve fit parameter estimates.

	Not adjusted for SAR							Adjusted for SAR						
SR Model	a	SE	b	SE	adj. var	auto	AICc	a	SE	b	SE	adj. var	auto	AICc
Rand-Walk	1.04	0.21	n/a	n/a	0.50	0.61	57.0	1.03	0.12	n/a	n/a	0.27	0.00	35.3
Const. Rec	270	58	n/a	n/a	n/a	n/a	59.7	269	43	n/a	n/a	n/a	n/a	48.3
Bev-Holt	1.76	1.06	726	647	0.55	0.52	58.6	1.37	0.39	1240	1059	0.25	-0.01	36.7
Hock-Stk	1.15	0.22	346	0	0.51	0.57	58.7	1.16	0.17	337	73	0.23	0.03	35.2
Ricker	1.61	0.69	0.00146	0.00126	0.55	0.52	58.5	1.37	0.34	0.00094	0.00073	0.25	0.00	36.5

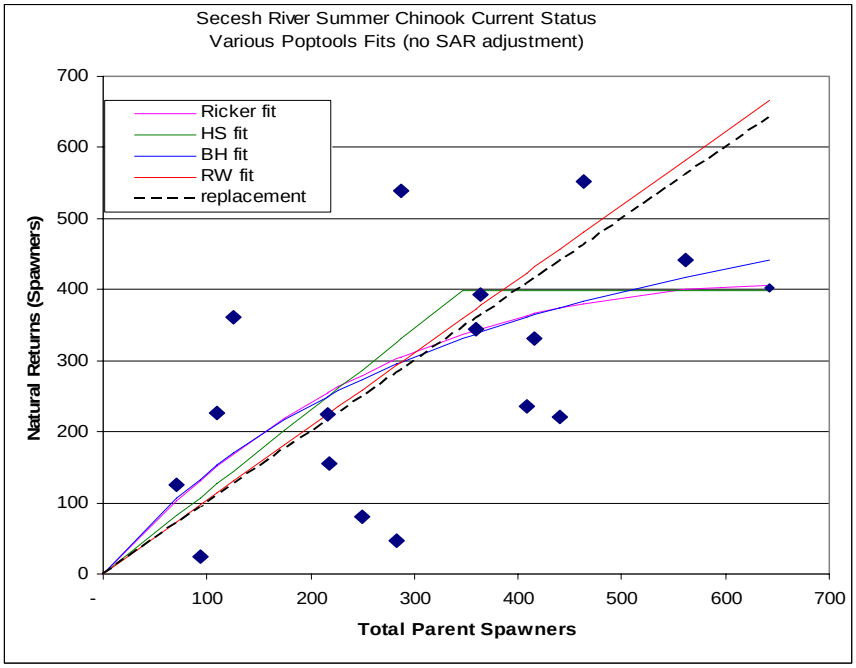

Figure 8. Stock recruitment curves for the Secesh River Summer Chinook population. Data not adjusted for marine survival. Points used in the current productivity calculation are bolded.

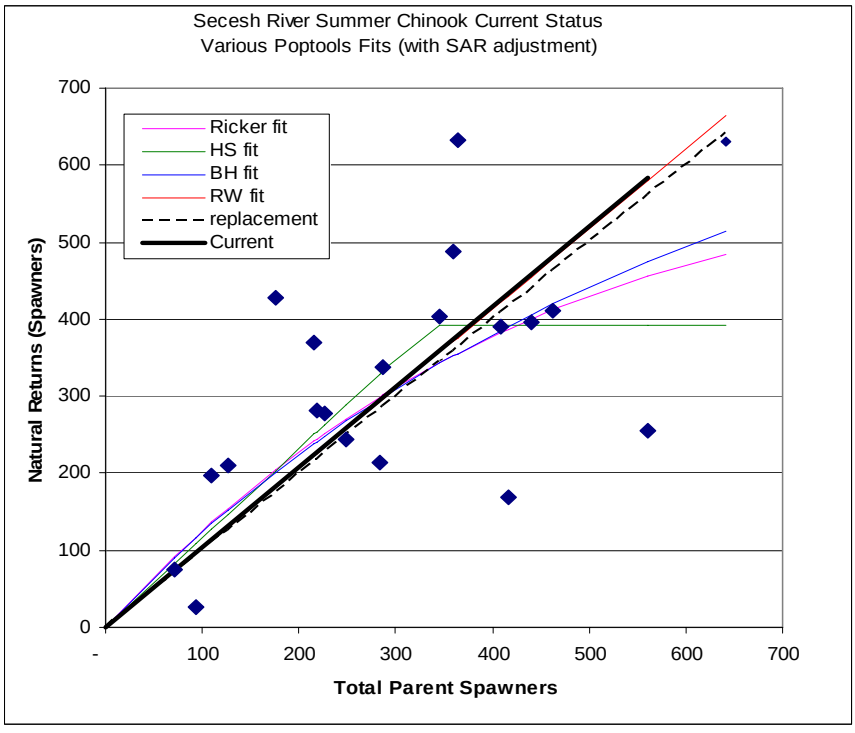

Figure 9. Stock-recruitment curves for the Secesh River Summer Chinook population. Data adjusted for marine survival. Points used in the current productivity calculation are bolded.